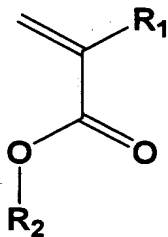


**What is claimed is:**

1        1. A resin with lowered polydispersity index,  
2 comprising the reaction product of the following reactants:  
3        at least two different acrylate monomers;  
4        at least one initiator; and  
5        at least one chain transfer reagent,  
6 wherein the reaction product has a polydispersity index  
7        of 1.5 or less.

1        2. The resin as claimed in claim 1, wherein the  
2 acrylate monomer has a formula (I), of.



wherein

R<sub>1</sub> is a hydrogen atom, a fluorine atom, a halogen atom,  
cyano group, saturated or unsaturated alkyl  
group, amino group, cycloalkyl group,  
heterocycloalkyl group, polycyclic alkyl group,  
aryl group, heteroaryl group, arylalkyl group, or  
alkylaryl group, wherein the saturated or  
unsaturated alkyl group is straight or branched  
and has 1 to 12 carbon atoms;

R<sub>2</sub> is a hydrogen atom, saturated or unsaturated alkyl  
group, cycloalkyl group, heterocycloalkyl group,  
polycyclic alkyl group, adamantyl group, aryl  
group, heteroaryl group, arylalkyl group, or

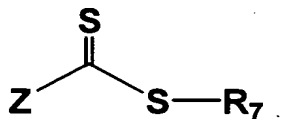
17           alkylaryl group, wherein the saturated or  
18           unsaturated alkyl group is straight or branched  
19           and has 1 to 12 carbon atoms; and  
20       optionally at least one hydrogen atom bonded to the  
21       carbon atom of the acrylate monomer according to  
22       formula (I) is substituted by a fluorine atom, a  
23       halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -  
24       R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
25       OCOR", or -OR", wherein R" is saturated or  
26       unsaturated alkyl group having 1 to 12 carbon  
27       atoms, thioalkyl group, alkynyloxy group,  
28       heterocycloalkyl group, alkoxy group, ester  
29       group, alkenyl group, alkynylene group,  
30       alkenyloxy group, heterocycloalkyl group, aryl  
31       group, arylalkyl group, alkylaryl group,  
32       heteroaryl group, or combinations thereof,  
33       provided that when R" has hydrogen atom bonded to  
34       the carbon, optionally at least one hydrogen atom  
35       bonded to the carbon atom of R" is substituted by  
36       a fluorine atom, or halogen atom.

1           3. The resin as claimed in claim 1, wherein the  
2       initiator is an agent generating free radical species  
3       through decomposition.

1           4. The resin as claimed in claim 1, wherein the  
2       initiator is peroxide initiators, azo initiators, or  
3       combinations thereof.

1           5.    The resin as claimed in claim 1, wherein the chain  
2 transfer reagent is a reversible addition-fragmentation  
3 chain transfer reagent.

1           6.    The resin as claimed in claim 1, wherein the chain  
2 transfer reagent is a reversible addition-fragmentation  
3 chain transfer reagent according to formula (III), of



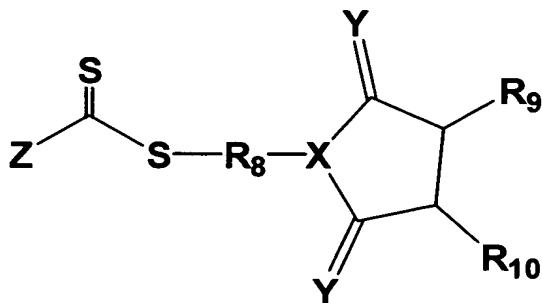
5            wherein

6 Z is a hydrogen atom, a fluorine atom, a halogen atom,  
7 cyano group, saturated or unsaturated alkyl  
8 group, amino group, cycloalkyl group,  
9 heterocycloalkyl group, polycyclic alkyl group,  
10 aryl group, heteroaryl group, arylalkyl group,  
11 alkylaryl group, heteroalkylaryl group,  $-\text{CO}_2\text{H}$ ,  $-\text{CO}_2\text{R}$ ,  $-\text{R}''\text{CO}_2\text{H}$ ,  $-\text{COR}$ ,  $-\text{CONH}_2$ ,  $-\text{CONHR}$ ,  $-\text{CONR}_2$ ,  $-\text{OCOR}$ ,  $-\text{OR}$ ,  $-\text{SR}$ ,  $-\text{NR}_2$ , or  $-\text{POR}_2$ , wherein R  
12 is saturated or unsaturated alkyl group having 1  
13 to 12 carbon atoms, thioalkyl group, alkynyloxy  
14 group, heterocycloalkyl group, alkoxy group,  
15 ester group, alkenyl group, alkynylene group,  
16 alkenyloxy group, heterocycloalkyl group, aryl  
17 group, arylalkyl group, alkylaryl group,  
18 heteroaryl group, or combinations thereof;  
19  
20

21 R<sub>7</sub> is a hydrogen atom, a fluorine atom, a halogen atom,  
22 cyano group, saturated or unsaturated alkyl  
23 group, amino group, cycloalkyl group,  
24 heterocycloalkyl group, polycyclic alkyl group,

25           aryl group, heteroaryl group, arylalkyl group, or  
26           alkylaryl group, wherein the saturated or  
27           unsaturated alkyl group is straight or branched  
28           and has 1 to 12 carbon atoms; and  
29       optionally at least one hydrogen atom bonded to the  
30           carbon atom of the RAFT reagent according to  
31           formula (III) is substituted by a fluorine atom,  
32           a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -  
33           R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
34           OCOR", or -OR", wherein R" is saturated or  
35           unsaturated alkyl group having 1 to 12 carbon  
36           atoms, thioalkyl group, alkynyloxy group,  
37           heterocycloalkyl group, alkoxy group, ester  
38           group, alkenyl group, alkynylene group,  
39           alkenyloxy group, heterocycloalkyl group, aryl  
40           group, arylalkyl group, alkylaryl group,  
41           heteroaryl group, or combinations thereof,  
42           provided that when R" has hydrogen atom bonded to  
43           the carbon, optionally at least one hydrogen atom  
44           bonded to the carbon atom of R" is substituted by  
45           a fluorine atom, or halogen atom.

1           7. The resin as claimed in claim 1, wherein the chain  
2       transfer reagent is a reversible addition-fragmentation  
3       chain transfer reagent according to formula (IV), of



wherein

Z is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, arylalkyl group, alkylaryl group, heteroalkylaryl group, -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", -OR", -SR" , -NR"<sub>2</sub>, or -POR"<sub>2</sub>, wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, arylalkyl group, alkylaryl group, heteroaryl group, or combinations thereof;

R<sub>8</sub> is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkoxy group, alkenyl group, alkynylene group, alkenyloxy group, alkynyloxy group, or combinations thereof;

R<sub>9</sub> and R<sub>10</sub> are the same or different and are a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group,

28 amino group, cycloalkyl group, heterocycloalkyl  
29 group, polycyclic alkyl group, aryl group,  
30 heteroaryl group, arylalkyl group, or alkylaryl  
31 group, wherein the saturated or unsaturated alkyl  
32 group is straight or branched and has 1 to 12  
33 carbon atoms;

34 X is N or -CH;

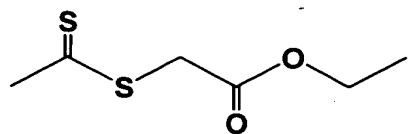
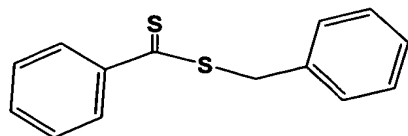
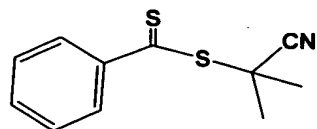
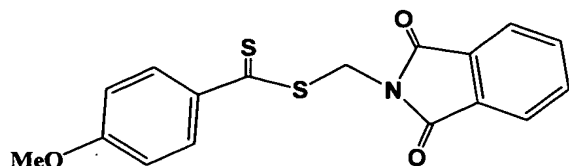
35 Y is O or S; and

36 optionally at least one hydrogen atom bonded to the  
37 carbon atom of the RAFT reagent according to  
38 formula (IV) is substituted by a fluorine atom, a  
39 halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -  
40 R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
41 OCOR", or -OR", wherein R" is saturated or  
42 unsaturated alkyl group having 1 to 12 carbon  
43 atoms, thioalkyl group, alkynyloxy group,  
44 heterocycloalkyl group, alkoxy group, ester  
45 group, alkenyl group, alkynylene group,  
46 alkenyloxy group, heterocycloalkyl group, aryl  
47 group, arylalkyl group, alkylaryl group,  
48 heteroaryl group, or combinations thereof,  
49 provided that when R" has a hydrogen atom bonded  
50 to the carbon, optionally at least one hydrogen  
51 atom bonded to the carbon atom of R" is  
52 substituted by a fluorine atom, or halogen atom.

1 8. The resin as claimed in claim 7, wherein the R<sub>9</sub>  
2 and R<sub>10</sub> are jointly constructed of cycloalkyl group,  
3 heterocycloalkyl group, cycloalkenyl group, arylalkyl group,

4 alkylaryl group, heteroaryl group, or polycyclic alkyl  
5 group.

1 9. The resin as claimed in claim 1, wherein the chain  
2 transfer reagent is



, or combinations thereof,

7 wherein

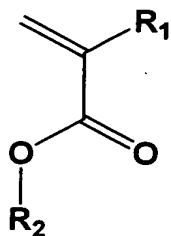
8 optionally at least one hydrogen atom bonded to the  
9 carbon atom of the chain transfer reagent is  
10 substituted by a fluorine atom, a halogen atom,  
11 cyano group, -R", -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -  
12 R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR" ,or -OR",  
13 wherein R" is saturated or unsaturated alkyl  
14 group having 1 to 12 carbon atoms, thioalkyl  
15 group, alkynyloxy group, heterocycloalkyl group,  
16 alkoxy group, ester group, alkenyl group,  
17 alkynylene group, alkenyloxy group,  
18 heterocycloalkyl group, aryl group, arylalkyl

19 group, alkylaryl group, heteroaryl group, or  
20 combinations thereof, provided that when R" has  
21 hydrogen atom bonded to the carbon, optionally at  
22 least one hydrogen atom bonded to the carbon atom  
23 of R" is substituted by a fluorine atom, or  
24 halogen atom.

1 10. The resin as claimed in claim 1, wherein the  
2 reaction product has an average molecular weight from 2000  
3 to 30000.

1 11. A resin with lowered polydispersity index,  
2 comprising the reaction product of the following reactants:  
3 at least one norbornene monomer in a ratio from 1ppm to  
4 100wt%;  
5 at least one acrylate monomer, in a ratio from 0wt% to  
6 99.99999wt%, based on the weight of at least one  
7 norbornene monomer and at least one acrylate  
8 monomer;  
9 at least one initiator; and  
10 at least one chain transfer reagent,  
11 wherein the reaction product has a polydispersity index  
12 of 1.5 or less.

1 12. The resin as claimed in claim 11, wherein the  
2 acrylate monomer has a formula (I), of:





wherein

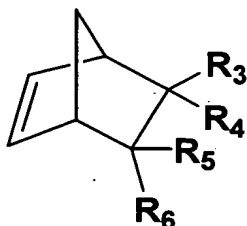
R<sub>1</sub> is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, arylalkyl group, or alkylaryl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms;

R<sub>2</sub> is a hydrogen atom, saturated or unsaturated alkyl group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, adamantyl group, aryl group, heteroaryl group, arylalkyl group, or alkylaryl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms; and

optionally at least one hydrogen atom bonded to the carbon atom of the acrylate monomer according to formula (I) is substituted by a fluorine atom, a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", or -OR", wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, arylalkyl group, alkylaryl group, heteroaryl group, or combinations thereof, provided that when R" has hydrogen atom bonded to

34 the carbon, optionally at least one hydrogen atom  
35 bonded to the carbon atom of R" is substituted by  
36 a fluorine atom, or halogen atom.

1 13. The resin as claimed in claim 11, wherein the  
2 norbornene monomer has a formula (II), of:



3

4

wherein

5

R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, and R<sub>6</sub> are the same or different and are a  
6 hydrogen atom, a fluorine atom, a halogen atom,  
7 cyano group, saturated or unsaturated alkyl  
8 group, amino group, cycloalkyl group,  
9 heterocycloalkyl group, polycyclic alkyl group,  
10 aryl group, heteroaryl group, arylalkyl group, or  
11 alkylaryl group, wherein the saturated or  
12 unsaturated alkyl group is straight or branched  
13 and has 1 to 12 carbon atoms; and

14

optionally at least one hydrogen atom bonded to the  
15 carbon atom of the norbornene monomer according  
16 to formula (II) is substituted by a fluorine  
17 atom, a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -  
18 CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -  
19 CONR"<sub>2</sub>, -OCOR", or -OR", wherein the R" is  
20 saturated or unsaturated alkyl group having 1 to  
21 12 carbon atoms, thioalkyl group, alkynyloxy  
22 group, heterocycloalkyl group, alkoxy group,

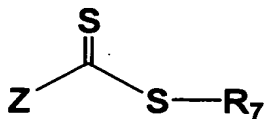
23 ester group, alkenyl group, alkynylene group,  
24 alkenyloxy group, heterocycloalkyl group, aryl  
25 group, arylalkyl group, alkylaryl group,  
26 heteroaryl group, or combinations thereof,  
27 provided that when R" has hydrogen atom bonded to  
28 the carbon, optionally at least one hydrogen atom  
29 bonded to the carbon atom of R" is substituted by  
30 a fluorine atom, or halogen atom.

1 14. The resin as claimed in claim 11, wherein the  
2 initiator is an agent generating free radical species  
3 through decomposition.

1 15. The resin as claimed in claim 11, wherein the  
2 initiator is peroxide initiators, azo initiators, or  
3 combinations thereof.

1 16. The resin as claimed in claim 11, wherein the  
2 chain transfer reagent is a reversible addition-  
3 fragmentation chain transfer reagent.

1 17. The resin as claimed in claim 11, wherein the  
2 chain transfer reagent is a reversible addition-  
3 fragmentation chain transfer reagent according to formula  
4 (III), of



6 wherein

7 Z is a hydrogen atom, a fluorine atom, a halogen atom,  
8 cyano group, saturated or unsaturated alkyl

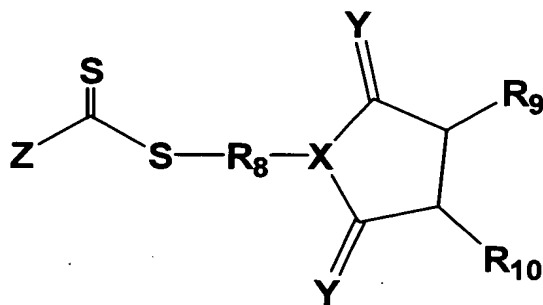
9 group, amino group, cycloalkyl group,  
10 heterocycloalkyl group, polycyclic alkyl group,  
11 aryl group, heteroaryl group, arylalkyl group,  
12 alkylaryl group, heteroalkylaryl group, -CO<sub>2</sub>H, -  
13 CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
14 OCOR", -OR", -SR" , -NR"<sub>2</sub>, or -POR"<sub>2</sub>, wherein R"  
15 is saturated or unsaturated alkyl group having 1  
16 to 12 carbon atoms, thioalkyl group, alkynyloxy  
17 group, heterocycloalkyl group, alkoxy group,  
18 ester group, alkenyl group, alkynylene group,  
19 alkenyloxy group, heterocycloalkyl group, aryl  
20 group, arylalkyl group, alkylaryl group,  
21 heteroaryl group, or combinations thereof;

22 R<sub>7</sub> is a hydrogen atom, a fluorine atom, a halogen atom,  
23 cyano group, saturated or unsaturated alkyl  
24 group, amino group, cycloalkyl group,  
25 heterocycloalkyl group, polycyclic alkyl group,  
26 aryl group, heteroaryl group, arylalkyl group, or  
27 alkylaryl group, wherein the saturated or  
28 unsaturated alkyl group is straight or branched  
29 and has 1 to 12 carbon atoms; and

30 optionally at least one hydrogen atom bonded to the  
31 carbon atom of the RAFT reagent according to  
32 formula (III) is substituted by a fluorine atom,  
33 a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -  
34 R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
35 OCOR", or -OR", wherein R" is saturated or  
36 unsaturated alkyl group having 1 to 12 carbon  
37 atoms, thioalkyl group, alkynyloxy group,  
38 heterocycloalkyl group, alkoxy group, ester

group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, arylalkyl group, alkylaryl group, heteroaryl group, or combinations thereof, provided that when R" has hydrogen atom bonded to the carbon, optionally at least one hydrogen atom bonded to the carbon atom of R" is substituted by a fluorine atom, or halogen atom.

18. The resin as claimed in claim 11, wherein the chain transfer reagent is a reversible addition-fragmentation chain transfer reagent according to formula (IV), of:



wherein

Z is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, arylalkyl group, alkylaryl group, heteroalkylaryl group, -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", -OR", -SR" , -NR"<sub>2</sub>, or -POR"<sub>2</sub>, wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy

group, heterocycloalkyl group, alkoxy group,  
ester group, alkenyl group, alkynylene group,  
alkenyloxy group, heterocycloalkyl group, aryl  
group, arylalkyl group, alkylaryl  
group, heteroaryl group, or combinations thereof;

R<sub>8</sub> is saturated or unsaturated alkyl group having 1 to  
12 carbon atoms, thioalkyl group, alkoxy group,  
alkenyl group, alkynylene group, alkenyloxy  
group, alkynyloxy group, or combinations thereof;

R<sub>9</sub> and R<sub>10</sub> are the same or different and selected from a  
hydrogen atom, a fluorine atom, a halogen atom,  
cyano group, saturated or unsaturated alkyl  
group, amino group, cycloalkyl group,  
heterocycloalkyl group, polycyclic alkyl group,  
aryl group, heteroaryl group, arylalkyl group, or  
alkylaryl group, wherein the saturated or  
unsaturated alkyl group is straight or branched  
and has 1 to 12 carbon atoms;

X is N or -CH;

Y is O or S; and

optionally at least one hydrogen atom bonded to the  
carbon atom of the RAFT reagent according to  
formula (IV) is substituted by a fluorine atom, a  
halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -  
R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -  
OCOR", or -OR", wherein R" is saturated or  
unsaturated alkyl group having 1 to 12 carbon  
atoms, thioalkyl group, alkynyloxy group,  
heterocycloalkyl group, alkoxy group, ester  
group, alkenyl group, alkynylene group,

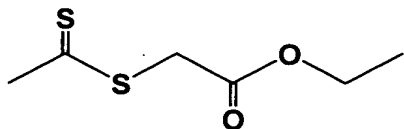
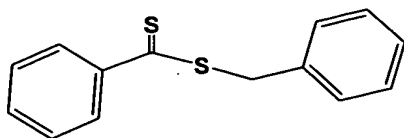
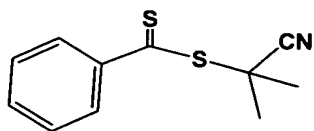
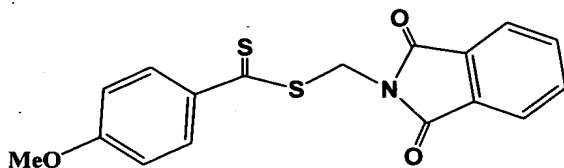
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alkenyloxy group, heterocycloalkyl group, aryl group, arylalkyl group, alkylaryl group, heteroaryl group, or combinations thereof, provided that when R" has hydrogen atom bonded to the carbon, optionally at least one hydrogen atom bonded to the carbon atom of R" is substituted by a fluorine atom, or halogen atom.

19. The resin as claimed in claim 18, wherein the R<sub>9</sub> and R<sub>10</sub> are jointly constructed of cycloalkyl group, heterocycloalkyl group, cycloalkenyl group, arylalkyl group, alkylaryl group, heteroaryl group, or polycyclic alkyl group.

20. The resin as claimed in claim 11, wherein the chain transfer reagent is



, or combinations thereof,

wherein

8 optionally at least one hydrogen atom bonded to the  
9 carbon atom of the chain transfer reagent is  
10 substituted by a fluorine atom, a halogen atom,  
11 cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -  
12 R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", or -OR",  
13 wherein R" is saturated or unsaturated alkyl  
14 group having 1 to 12 carbon atoms, thioalkyl  
15 group, alkynyloxy group, heterocycloalkyl group,  
16 alkoxy group, ester group, alkenyl group,  
17 alkynylene group, alkenyloxy group,  
18 heterocycloalkyl group, aryl group, arylalkyl  
19 group, alkylaryl group, heteroaryl group, or  
20 combinations thereof, provided that when R" has  
21 hydrogen atom bonded to the carbon, optionally at  
22 least one hydrogen atom bonded to the carbon atom  
23 of R" is substituted by a fluorine atom, or  
24 halogen atom.

1 21. The resin as claimed in claim 11, wherein the  
2 reaction product has an average molecular weight from 2000  
3 to 30000.

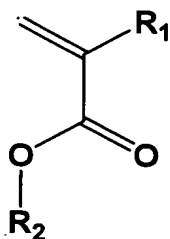
1 22. A preparation of a resin with lowered PDI,  
2 comprising:

3 reacting at least one reactive monomer, at least one  
4 initiator, and at least one chain transfer  
5 reagent undergoing polymerization to obtain a  
6 resin with lowered PDI,

7 wherein the reactive monomer comprises acrylate  
8 monomer, norbornene monomer, or combinations  
9 thereof.



23. The preparation as claimed in claim 22, wherein  
the acrylate monomer has a formula (I), of.



wherein

R<sub>1</sub> is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, arylalkyl group, or alkylaryl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms;

R<sub>2</sub> is a hydrogen atom, saturated or unsaturated alkyl group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, adamantyl group, aryl group, heteroaryl group, alkylaryl group, or arylalkyl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms; and

optionally at least one hydrogen atom bonded to the carbon atom of the acrylate monomer according to formula (I) is substituted by a fluorine atom, a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", or -OR", wherein R" is saturated or

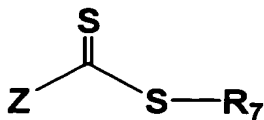
26           unsaturated alkyl group having 1 to 12 carbon  
27           atoms, thioalkyl group, alkynyloxy group,  
28           heterocycloalkyl group, alkoxy group, ester  
29           group, alkenyl group, alkynylene group,  
30           alkenyloxy group, heterocycloalkyl group, aryl  
31           group, arylalkyl group, alkylaryl group,  
32           heteroaryl group, or combinations thereof,  
33           provided that when R" has hydrogen atom bonded to  
34           the carbon, optionally at least one hydrogen atom  
35           bonded to the carbon atom of R" is substituted by  
36           a fluorine atom, or halogen atom.

1           24. The preparation as claimed in claim 22, wherein  
2           the initiator is an agent generating free radical species  
3           through decomposition.

1           25. The preparation as claimed in claim 22, wherein  
2           the initiator is peroxide initiator, azo initiators, or  
3           combinations thereof.

1           26. The preparation as claimed in claim 22, wherein  
2           the chain transfer reagent is a reversible addition-  
3           fragmentation chain transfer reagent.

1           27. The preparation as claimed in claim 22, wherein  
2           the chain transfer reagent is a reversible addition-  
3           fragmentation chain transfer reagent according to formula  
4           (III), of



wherein

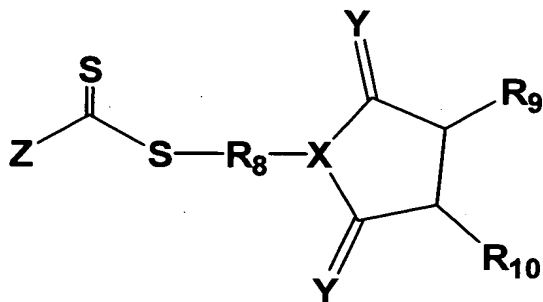
Z is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, alkylaryl group, arylalkyl group, heteroalkylaryl group, -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", -OR", -SR" , -NR"<sub>2</sub>, or -POR"<sub>2</sub>, wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, group, heteroaryl group, arylalkyl group, or combinations thereof;

R<sub>7</sub> is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, alkylaryl group, or arylalkyl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms; and

optionally at least one hydrogen atom bonded to the carbon atom of the RAFT reagent according to formula (III) is substituted by a fluorine atom, a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -OCOR", or -OR", wherein R" is saturated or

unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, alkylaryl group, heteroaryl group, arylalkyl group, or combinations thereof, provided that when R" has hydrogen atom bonded to the carbon, optionally at least one hydrogen atom bonded to the carbon atom of R" is substituted by a fluorine atom, or halogen atom.

28. The preparation as claimed in claim 22, wherein the chain transfer reagent is a reversible addition-fragmentation chain transfer reagent according to formula (IV), of:



wherein

Z is a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, alkylaryl group, arylalkyl group, heteroalkylaryl group, -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -CONH<sub>2</sub>, -CONHR", -CONR"<sub>2</sub>, -

OCOR", -OR", -SR" , -NR<sub>2</sub>, or -POR<sub>2</sub>, wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, alkylaryl group, heteroaryl group, arylalkyl group, or combinations thereof;

R<sub>8</sub> is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkoxy group, alkenyl group, alkynylene group, alkenyloxy group, alkynyloxy group, or combinations thereof;

R<sub>9</sub> and R<sub>10</sub> are the same or different and selected from a hydrogen atom, a fluorine atom, a halogen atom, cyano group, saturated or unsaturated alkyl group, amino group, cycloalkyl group, heterocycloalkyl group, polycyclic alkyl group, aryl group, heteroaryl group, alkylaryl group, or arylalkyl group, wherein the saturated or unsaturated alkyl group is straight or branched and has 1 to 12 carbon atoms;

X is N or -CH;

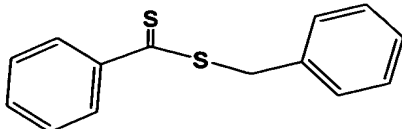
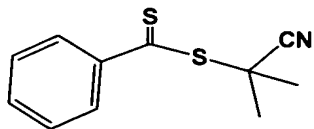
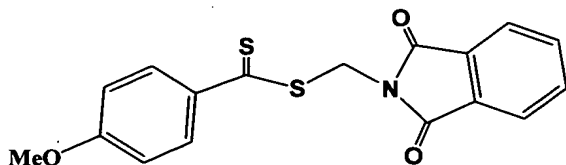
Y is O or S; and

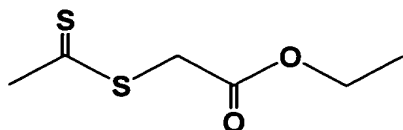
optionally at least one hydrogen atom bonded to the carbon atom of the RAFT reagent according to formula (IV) is substituted by a fluorine atom, a halogen atom, cyano group, -R", -CO<sub>2</sub>H, -CO<sub>2</sub>R", -R"CO<sub>2</sub>H, -COR", -R"CN, -CONH<sub>2</sub>, -CONHR", -CONR<sub>2</sub>, -OCOR", or -OR", wherein R" is saturated or unsaturated alkyl group having 1 to 12 carbon

atoms, thioalkyl group, alkynyloxy group,  
heterocycloalkyl group, alkoxy group, ester  
group, alkenyl group, alkynylene group,  
alkenyloxy group, heterocycloalkyl group, aryl  
group, alkylaryl group, heteroaryl group,  
arylalkyl group, or combinations thereof,  
provided that when R" has hydrogen atom bonded to  
the carbon, optionally at least one hydrogen atom  
bonded to the carbon atom of R" is substituted by  
a fluorine atom, or halogen atom.

29. The preparation as claimed in claim 28, wherein  
the R<sub>9</sub> and R<sub>10</sub> are jointly constructed of cycloalkyl group,  
heterocycloalkyl group, cycloalkenyl group, alkylaryl group,  
arylalkyl group, heteroaryl group, or polycyclic alkyl  
group.

30. The preparation as claimed in claim 22, wherein  
the chain transfer reagent is





, or combinations thereof,

wherein

optionally at least one hydrogen atom bonded to the carbon atom of the chain transfer reagent is substituted by a fluorine atom, a halogen atom, cyano group,  $-R''$ ,  $-CO_2H$ ,  $-CO_2R''$ ,  $-R''CO_2H$ ,  $-COR''$ ,  $-R''CN$ ,  $-CONH_2$ ,  $-CONHR''$ ,  $-CONR''_2$ ,  $-OCOR''$ , or  $-OR''$ , wherein  $R''$  is saturated or unsaturated alkyl group having 1 to 12 carbon atoms, thioalkyl group, alkynyloxy group, heterocycloalkyl group, alkoxy group, ester group, alkenyl group, alkynylene group, alkenyloxy group, heterocycloalkyl group, aryl group, alkylaryl group, heteroaryl group, arylalkyl group, or combinations thereof, provided that when  $R''$  has hydrogen atom bonded to the carbon, optionally at least one hydrogen atom bonded to the carbon atom of  $R''$  is substituted by a fluorine atom, or halogen atom.

31. The preparation as claimed in claim 22, wherein the reaction product has an average molecular weight from 2000 to 30000.